Original Article

# Analysis of outcome of end-to-end and end-to-side internal iliac artery anastomosis in renal transplantation: Our initial experience with a case series

Dilip Kumar Pal, Prakash Kumar Sanki[1], Sayak Roy

Departments of Urology and [1]Cardio Thoracic and Vascular Surgery, Institute of Post Graduate Medical Education and Research, Kolkata, West Bengal, India

## Abstract

**Introduction:** In renal transplantation, there is end-to-side anastomosis of renal artery to external iliac artery and end-to-end anastomosis of renal artery to internal iliac artery. The end-to-end internal iliac artery anastomosis can be associated with complications due to compromised distal vascular supply to limbs and penile erectile tissue. A method of end-to-side anastomosis can overcome them. Till date, there is no case series or trial that has studied the effect of end-to-side anastomosis. This study is aimed at comparing the outcome of end-to-side and end-to-end anastomosis, so as to evaluate the efficacy of end-to-side technique.

**Materials and Methods:** A total of 40 renal transplant recipients were taken, with internal iliac artery anastomosis, and were divided into two groups, 20 patients with end-to-end and 20 patients with end-to-side anastomosis. The cold ischemia time, arterial anastomosis time, post-operative bleeding and urine leak, claudication, saddle anesthesia and erectile dysfunction, and follow-up recipient creatinine and eGFR and Doppler to look for graft renal artery patency (at 6 months post-transplant) were compared between the two groups.

**Results:** The intraoperative cold ischemia time was slightly more in the group with end-to-end anastomosis, but it was statistically significant ($P = 0.22$). The arterial anastomosis time was comparable in both the groups ($P = 0.65$). In the end-to-end group, 15%, 20% and 15% patients had post-operative saddle anaesthesia, claudication and mild-to-moderate erectile dysfunction, which were absent in the end-to-side group. On follow-up, the mean recipient serum creatinine and eGFR were comparable in the two groups. Also, the graft renal artery patency on Doppler was comparable.

**Conclusion:** The end-to-side technique can be definitely applied for renal transplantation, with some advantages over end-to-end technique, and without compromising efficacy.

**Key Words:** Claudication, erectile dysfunction, internal iliac artery, saddle anesthesia

**Address for correspondence:**
Prof. Dilip Kumar Pal, Department of Urology, Institute of Post Graduate Medical Education and Research, 244, AJC Bose Road, Kolkata - 700 020, West Bengal, India. E-mail: drdkpal@yahoo.co.in

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## INTRODUCTION

There are more than one million sufferers of end-stage kidney disease worldwide. Kidney transplantation provides the only chance of gaining independence from dialysis. Kidney transplantation is the optimum replacement therapy for patients with established renal failure as it offers better quality of life and improved survival. Kidney transplantation offers longer and better quality of life compared to dialysis. However, the procedure of renal transplantation is complex, and the success of transplantation is influenced by donor and recipient selection, the surgical procedure itself, and appropriate medical management of the transplant recipient.

In renal transplantation, vascular anastomosis plays a major role. It refers to the establishment of graft kidney perfusion after it is implanted in the recipient, by way of arterial and venous anastomosis. The usual norm is to anastomosis the donor renal artery to the recipient's external iliac artery and the donor renal vein to the recipient's external iliac vein. However, arterial anastomosis is not fixed. Over the years, two techniques have been in vogue, end-to-side anastomosis of renal artery to external iliac artery and end-to-end anastomosis of renal artery to internal iliac artery. Studies have shown no significant difference in outcome between the two techniques.[1]

The use of internal iliac artery is very often restricted to cases where the external iliac artery has already been used previously or in cases where there is evidence of atherosclerosis of external iliac artery on Doppler study. This technique provides good feasibility in case of short transplant renal artery since internal iliac trunk can be used at different lengths. However, incongruity of lumen often makes the anastomosis a complex procedure. The luxation of internal iliac artery bears the risk of kinking, leading to vascular occlusion.[2] In general, the use of internal iliac artery for anastomosis to the donor renal artery is less favored owing to the smaller size and comparatively narrower caliber of internal iliac artery and also to the need to ligate its branches in order to facilitate the end-to-end anastomosis to the renal artery. End-to-end anastomosis is associated with the risk of jeopardizing the distal vascular supply that may lead to certain complications, particularly in males, such as saddle anesthesia, erectile dysfunction (ED), and claudication.[3]

In this setting, if a method of end-to-side anastomosis of renal artery to internal iliac artery is employed, it can overcome the complications associated with end-to-end anastomosis. Till date, there is no case series or trial that has studied the effect of end-to-side internal iliac artery anastomosis. There is only one online case report, published in literature, of a cadaveric transplant, in which this type of anastomosis was performed.[4]

In our institute, by collaboration of urology and nephrology departments, renal transplants are being regularly performed. This article outlines our initial experience of the end-to-side technique of internal iliac artery anastomosis and compares them with the end-to-end technique. Its aim is to evaluate the efficacy of the end-to-side procedure.

## MATERIALS AND METHODS

In this prospective hospital-based study, during a period of 3 years, a total of 40 renal transplant recipient patients underwent internal iliac artery anastomosis. Of the 40 patients, in 20 patients, end-to-end internal iliac artery anastomosis was done, and in the other 20 patients, end-to-side internal iliac artery anastomosis was done. In both groups, renal vein was anastomosis end-to-side to external iliac vein. The two groups were compared with respect to cold ischemia time, arterial anastomosis time, operation-related complications, and postoperative late complications such as saddle anesthesia, ED, and claudication. Saddle anesthesia and claudication were assessed based on history taking from the recipients, while ED assessment was done by way of the International Index of Erectile Function-5 (IIEF-5) questionnaire. The IIEF-5 scoring system has a total score of 25, which is graded as follows.

| Score | Grade of ED |
|---|---|
| 1–7 | Severe ED |
| 8–11 | Moderate ED |
| 12–16 | Mild-to-moderate ED |
| 17–21 | Mild ED |
| 22–25 | No ED |

ED: Erectile dysfunction

In addition, the patients were followed up at 6 months posttransplant to assess for graft function and any delayed arterial anastomotic complication (renal artery stenosis). For this assessment, we employed estimation of recipient's serum creatinine and calculation of estimated glomerular filtration rate (eGFR) by the modification of diet in renal disease equation. Furthermore, graft renal artery Doppler study was conducted at 6 months posttransplant to assess peak systolic velocity (PSV) and resistive index (RI). The results were compared between the two groups of recipients, and statistical analysis was done using the Student's *t*-test.

## RESULTS

A total of 40 patients were taken, 20 with end-to-end and 20 with end-to-side anastomosis. The mean age of the recipients was 35.2 ± 1.5 in the group of end-to-end anastomosis and 39.1 ± 1.7 in the group of end-to-side anastomosis.

The two groups were compared, and the results are as follows.

The intraoperative cold ischemia time was slightly more in the group with end-to-end anastomosis, but the result was not found to be statistically significant ($P = 0.22$). The arterial anastomosis time was comparable in both the groups ($P = 0.65$) [Table 1].

The incidence of significant bleeding and postoperative urine leakage was very low in both the groups. In Group A (end-to-end anastomosis), there were 3 out of 20 patients (15%) who complained of saddle anesthesia in the posttransplant period. In addition, there were 4 out of 20 patients (20%) in Group A who complained of claudication of lower limbs and buttock in the posttransplant period. Furthermore, 3 out of 20 patients (15%) in Group A developed ED [Table 2].

Among the patients with ED, 2 patients had mild-moderate ED and 1 had moderate ED (as per the IIEF questionnaire) [Table 3].

On follow-up of the patients at 6 months posttransplant, the mean recipient serum creatinine and eGFR were comparable in the two groups [Table 4]. Furthermore, the graft renal artery PSV and RI were comparable in the two groups, with no statistically significant difference ($P = 0.18$ for PSV and $P = 0.20$ for RI) [Table 5]. None of the patients in both the groups developed graft renal artery stenosis in the follow-up period.

**Table 1: Intraoperative comparison parameters between two groups**

| Parameter (min) | Group A | Group B | *P* |
|---|---|---|---|
| Cold ischemia time | 80±14.8 | 74±15.1 | 0.22 |
| Arterial anastomosis time | 23.8±7.2 | 24.6±7.5 | 0.65 |

**Table 2: Postoperative complications in the two groups**

| Complications | Group A (%) | Group B (%) |
|---|---|---|
| Bleeding | 1 (5) | 1 (5) |
| Urine leak | 1 (5) | 0 |
| Saddle anesthesia | 3 (15) | 0 |
| Claudication | 4 (20) | 0 |
| ED | 3 (15) | 0 |

ED: Erectile dysfunction

**Table 3: Severity of erectile dysfunction in Group A**

| Severity of ED | No of cases |
|---|---|
| No ED (%) | 17 (85) |
| Mild ED | 0 |
| Mild-moderate ED | 2 |
| Moderate ED | 1 |
| Severe ED | 0 |

ED: Erectile dysfunction

**Table 4: Graft-functional parameters on follow-up at 6 months**

| Graft-function parameter | Group A | Group B | *P* |
|---|---|---|---|
| Creatinine | 1.2±0.2 | 1.1±0.3 | 0.91 |
| eGFR | 81.9±13 | 80.7±12 | 0.84 |

eGFR: Estimated glomerular filtration rate

**Table 5: Graft Doppler study results on follow-up at 6 months**

| Doppler parameter | Group A | Group B | *P* |
|---|---|---|---|
| PSV | 142.2±54.2 | 139.7±50.1 | 0.18 |
| RI | 0.69±0.11 | 0.67±0.09 | 0.20 |

PSV: Peak systolic velocity of main graft renal artery, RI: Resistive index of main graft renal artery

## DISCUSSION

Vascular anastomosis is the main crux of a successful renal transplantation. Both external iliac and internal iliac artery have been used for arterial anastomosis. The external iliac artery is obviously preferred owing to its larger caliber, more superficial location, and the fact that it is advantageous in case of short renal artery and in case of existence of accessory renal or polar arteries.[5] The internal iliac artery is often used, but it has the problem of a lesser lumen caliber and the risk of kinking due to luxation. Moreover, impairment of distal blood flow may have impact on penile vascularity and erectile function.[6] However, still, internal iliac artery anastomosis has a place in renal transplantation, especially in case of multiple arteries of renal graft and in case of diseased external iliac artery.

In our study, we included the patients who had undergone internal iliac artery anastomosis in the last 3 years (number is 40, which is less than the number of patients with external iliac artery anastomosis during this period, which is 67).

On comparing the intraoperative and postoperative parameters, as mentioned before, between the two groups (end-to-end and end-to-side anastomosis), it was seen that cold ischemia time, arterial anastomosis time, eGFR at 6 months, and PSV and RI on renal graft Doppler at 6 months were comparable between the two groups, with no statistically significant difference. One observation was that the mean cold ischemia time was somewhat, to a little extent, lesser in the end-to-side group. This can be attributed to the fact that during end-to-side anastomosis, neither there is need to ligate any of the distal branches of internal iliac artery, nor there is any need to divide the artery, which would obviously take a little more time (as is the case with end-to-end anastomosis). Furthermore, in the end-to-end anastomosis group, 3 patients had ED, 4 patients had claudication, and 3 patients had saddle anesthesia. This can be attributed to the compromise of distal blood supply in case of end-to-end anastomosis, which does not occur in case of end-to-side anastomosis (no evidence of saddle anesthesia, claudication, or ED in our study in the end-to-side group). However, obviously, it is not an absolute fact that all end-to-end anastomosis cases will have distal vascular compromise as is evident by the fact that the majority of patients in the end-to-end group did not have such complications in the posttransplant period.

It can be assumed somewhat that 40 patients underwent internal iliac artery anastomosis probably due to the fact that there were multiple arteries or previously used or diseased external iliac artery. The end-to-side technique could minimize the complications associated with the internal iliac artery anastomosis, without compromising the efficacy and posttransplant graft-functioning capacity. Although there is no available literature regarding any case series of end-to-side internal iliac artery anastomosis (except for an online case report),[4] the results of our study are comparable to the results of external iliac artery anastomosis mentioned in different studies.

## CONCLUSION

We advocate the fact that in the realm of internal iliac artery anastomosis for renal transplantation, end-to-side technique has certain clear advantages over the end-to-end technique. The graft function and postanastomosis vascular patency are comparable between the two techniques. As a result, this technique of end-to-side anastomosis can be definitely applied for renal transplantation in the days to come. However, we do need to use it on a much larger number of patients to better and further assess its pros and cons.

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### Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Daowd R, Al Ahmad A. Renal artery anastomosis to internal or external iliac artery in kidney transplant patients. Saudi J Kidney Dis Transpl 2015;26:1009-12.
2. Fechner G, von Pezold C, Hauser S, Gerhardt T, Klehr HU, Müller SC. Impairment of long-term graft function after kidney transplantation by intraoperative vascular complications. Int Urol Nephrol 2008;40:869-73.
3. Rayt HS, Bown MJ, Lambert KV, Fishwick NG, McCarthy MJ, London NJ, *et al*. Buttock claudication and erectile dysfunction after internal iliac artery embolization in patients prior to endovascular aortic aneurysm repair. Cardiovasc Intervent Radiol 2008;31:728-34.
4. Mohamed IH, Bagul A, Doughman T, Nicholson ML. Use of internal iliac artery as a side-to-end anastomosis in renal transplantation. Ann R Coll Surg Engl 2012;94:e36-7.
5. Beckman JH, Jacobs S, Klempnauer J. Arterial reconstruction in kidney transplantation. Tex Med 2008;20:7-12.
6. El-Bahnasawy MS, El-Assmy A, Dawood A, Abobieh E, Dein BA, El-Din AB, *et al*. Effect of the use of internal iliac artery for renal transplantation on penile vascularity and erectile function: A prospective study. J Urol 2004;172(6 Pt 1):2335-9.